

# FRESHWATER ZOOPLANKTON (ROTIFERA, CLADOCERA AND COPEPODA) FROM THALE-NOI, SOUTH THAILAND

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## ABSTRACT

This work is a study of freshwater zooplankton (Rotifera, Cladocera and Copepoda) from nine localities in Thale-Noi, South Thailand. A total of 126 species were identified including 106 species of rotifers, 17 species of cladocerans and 3 species of copepods. Of the 126 taxa identified, 20 species of the rotifers, 7 species of the cladocerans and 2 species of the copepods, are new to Thailand.

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## INTRODUCTION

There are very few works dealing with the taxonomical study of freshwater zooplankton in Thailand. De Ridder<sup>1</sup> described the rotifers found in the Northern and Central parts of Thailand. Lai and Fernando<sup>2</sup> carried out a detailed study of freshwater Calanoida of Thailand, of which 14 species were recorded. Boonsom<sup>3</sup> studied the freshwater zooplankton of Thailand, and she found 80 species of Rotifera, 48 Cladocera, 21 Copepoda, 1 Ostracoda and 1 Brachiura. Later, Segers and Sanoamuang<sup>4</sup> described two more new species of *Lecane* from North-east Thailand. In the same year, Dumont and Ranga Reddy<sup>5</sup> described a new species of Calanoida collected from the Bangkok area. Sanoamuang et al.<sup>6</sup> revised the rotifer fauna of South-east Asia and described some new species from North-east Thailand. Two-hundred species of Rotifera were listed. However, there is little information about freshwater zooplankton from the southern part of Thailand. The purpose of this study is to address this omission through a study of three groups of freshwater zooplankton, the Rotifera, Cladocera, and Copepoda from Thale-Noi, South Thailand.

## MATERIALS AND METHODS

### Study area

Thale-Noi is a small area of water situated in the northernmost part of Songkhla lake in South Thailand, between latitude 7° 45' N to 7° 55' N and longitude 100° 05' E to 100° 15' E. It covers an area of about 30 km<sup>2</sup>. This area has ecological importance and is reserved as a bird sanctuary.

### Zooplankton sampling and identification

Plankton samples were collected from the localities shown in Figure 1. The samples were taken by oblique hauling of a 20 µm mesh-size plankton net. They were preserved immediately in 4% formaldehyde. Selection and study of Rotifera, Cladocera and Copepoda were carried out using a Wild M5 dissecting microscope and a Kyowa Medilux - 12 microscope. Drawings were made using a camera lucida. Identification was completed using the available keys and publications. Rotifers were identified according to the works of Koste<sup>7</sup>, Koste and

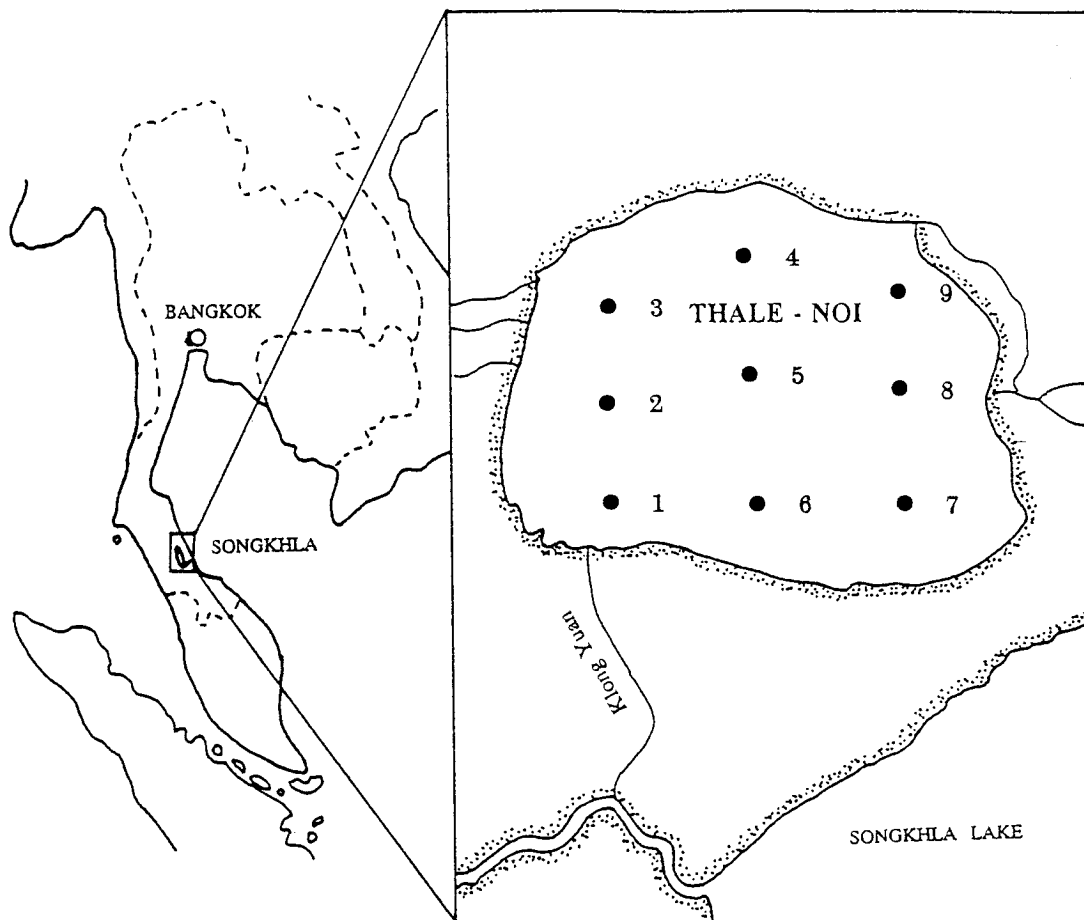


Fig. 1. Sampling stations in Thale-noi, Pattalung province.

Shiel<sup>8-13</sup>, Ryttner - Kolisko<sup>14</sup>, and Segers.<sup>15,16</sup> For Cladocera, the works of Idris<sup>17</sup>, Korovchinsky<sup>18</sup>, Michael and Sharma<sup>19</sup>, Smirnov<sup>20,21</sup> and Smirnov and Timms<sup>22</sup> were used. For identification of Copepoda, the references of Dussart and Defaye<sup>23</sup>, Ranga Reddy<sup>24</sup> and Shen and Song<sup>25</sup> were helpful.

All measurements were in  $\mu\text{m}$ .

## RESULTS AND DISCUSSION

A list of the Rotifera, Cladocera and Copepoda found in this study is presented in Table 1. In total, 126 species were identified, many of which were found in low density or as single individuals. This total is incomplete, as many unidentifiable taxa were encountered. From the present study, 106 species of Rotifera, 17 species of Cladocera and 3 species of Copepoda are recorded.

Among Rotifera, One *Cephalodella*, one *Colurella*, one *Lecane* and one *Trichocerca* were not previously known and will be published elsewhere. One *Lecane*, *L. sympoda* and one *Lepadella*, *L. minoruoides* have not yet been recorded from Asia and 14 species are new to Thailand (as indicated by an asterisk in Table 1). The most diverse genera were *Lecane* (26.19%), followed by *Lepadella* (11.9%), *Brachionus* (7.94%) and *Trichocerca* (7.94%). This corresponds with existing knowledge on the composition of rotifer in North-eastern Thailand.<sup>6</sup> Most of the species recorded were common, cosmopolitan and have already been recorded in tropical regions. The most frequently encountered rotifers were *Anuraeopsis fissa*, *Lecane bulla*, *L. closteroerca*, *L. hamata*, *L. lunaris* and *L. signifera*. *Lecane minuta* Segers (Fig. 1-2) is recorded for the second time after its description from Brunai.<sup>15</sup> *L. sympoda* Hauer (Fig. 3) was previously encountered in Germany<sup>26</sup> and Nigeria.<sup>16</sup> This is the third record of this species.

Of Cladocera, 47 species were recognised by Boonsom<sup>3</sup>, while 17 species have been listed as present here. Among these, 7 species were considered new to Thailand (as indicated by asterisk in Table 1). *Leydigia ciliata* Gauthier (Figs. 4-7), found in the present study, was similar to specimens found in Australia.<sup>22</sup> It is the first appearance of this species in South-east Asia. Chydoridae formed a dominant fraction of the report taxa, comprising 12 species from 8 genera. The most common species were *Bosminopsis deitersi* Richard, *Ephemeroporus barroisi* group and *Macrotrix triserialis* Brady. It is a little surprising, perhaps, that this study found only 16 species compared with the 47 species recognised by Boonsom.<sup>3</sup> Possibly, the sampling localities containing a great number of fish species, which are known to be active predators of Cladocera, resulted in the low number of Cladocera species collected.

Of Copepoda, approximately 11 species of cyclopoids and 15 species of calanoids have been recorded in Thailand.<sup>2,3,5</sup> However, only one species of cyclopoid and 2 species of calanoids were recorded in the present study. Both of the 2 calanoids, *Schmackeria* sp. and *Acartiella sinensis*, have not been recorded in Thailand before. Since only a single female of the genus *Schmackeria* was found, species identification was not possible. *A. sinensis* Shen & Lee (Figs. 8-15) had been previously recorded in China.<sup>25</sup> This is the second record of this species and the addition of figures on 1<sup>st</sup>, 4<sup>th</sup> and 5<sup>th</sup> appendages are provided.

The discovery of several new records of freshwater zooplankton in Thailand demonstrates that much more study need to be carried out into these Thai fauna. There is no doubt that further study will increase the number of species recorded here, and also will provide more information about Thai zooplankton biogeography. Additional effort will thus be required to obtain a truly comprehensive picture of the zooplankton species of Thailand.

**Table 1.** Rotifera, Cladocera and Copepoda taxa reported in this study. + = present in the waterbody.

\* = New record for Thailand; \*\* = New to Asia; \*\*\* = New species.

Species	Stations								
	1	2	3	4	5	6	7	8	9
<b>ROTIFERA</b>									
<i>Anuraeopsis coelata</i> (De Beauchamp)					+	+	+		
<i>A. fissa</i> (Gosse)	+	+		+	+	+	+	+	
<i>A. navicula</i> (Rousselet)					+				
<i>Ascomorpha ecaudis</i> (Perty)	+								
<i>A. saltans</i> Bartsch	+								
<i>Asplanchna tropica</i> Koste & Tobias					+				
<i>Brachionus angularis</i> Daday					+	+	+		
<i>B. calyciflorus</i> Pallas						+			
<i>B. caudatus</i> Barrois & Daday	+				+	+	+		
<i>B. dichotomus</i> Shephard									+
<i>B. donneri</i> Brehm	+				+	+			
<i>B. falcatus</i> Zacharias	+				+	+	+		
<i>B. forficula</i> Wierzeiski					+	+			
<i>B. quadridentatus</i> Hermann	+				+		+	+	+
<i>B. niwati</i> Sanoamuang, Segers & Dumont			+						
<i>B. rubens</i> Ehrenberg			+						
<i>Cephalodella gibba</i> (Ehrenberg)									+
*** <i>C. new species</i>	+								
<i>Colurella obtusa</i> (Gosse)	+	+							
<i>C. uncinata</i> (O.F. Müller)	+		+	+	+	+			
*** <i>C. new species</i>									+
* <i>Cupelopagis vorax</i> (Leidy)	+								
* <i>Cyrtonia tuba</i> Ehrenberg	+								
<i>Dicranophorus claviger</i> (Hauer)	+								+
* <i>D. prionacis</i> Harring & Myers	+								
<i>Dipleuchanis propatula</i> (Gosse)			+						+
<i>Euclanis dilatata</i> Ehrenberg		+				+			
<i>Hexathra intermedia</i> Wiszniewski					+				
<i>H. mira</i> (Hudson)					+				
<i>Itula</i> species		+							
<i>Keratella cochlearis</i> (Gosse)					+	+			+
<i>K. lenzi</i> Hauer	+								
<i>K. tropica</i> (Apstein)	+	+			+	+	+	+	

Species	Stations								
	1	2	3	4	5	6	7	8	9
<i>Lecane aculeata</i> (Jakubski)	+			+			+	+	
<i>L. arcula</i> Harring	+	+	+	+				+	
<i>L. batillifer</i> (Murray)				+					
* <i>L. bifurca</i> (Bryce)								+	+
<i>L. bulla</i> (Gosse)	+	+	+	+	+	+	+	+	+
* <i>L. clara</i> (Bryce)			+	+	+			+	+
<i>L. clostercerca</i> (Schmarda)	+	+	+	+	+		+	+	+
<i>L. crepida</i> Harring	+				+				
<i>L. curvicornis</i> (Murray)	+	+	+	+	+				
<i>L. furcata</i> (Murray)	+	+	+						
<i>L. hamata</i> (Stokes)	+	+	+	+	+	+	+	+	
<i>L. hornemanni</i> (Ehrenberg)	+	+		+	+	+		+	
<i>L. inermis</i> (Bryce)								+	
<i>L. laterlis</i> Sharma				+					
<i>L. leontina</i> (Turner)	+		+		+			+	+
<i>L. ludwigi</i> (Eckstein)		+	+						
<i>L. luna</i> (O.F. Müller)		+							
<i>L. lunaris</i> (Ehrenberg)	+	+	+	+	+			+	+
* <i>L. minuta</i> Segers									+
<i>L. nana</i> (Murray)				+					
<i>L. obtusa</i> (Murray)	+			+					
<i>L. papuana</i> (Murray)	+		+						
* <i>L. pertica</i> Harring & Myers	+								
<i>L. quadridentata</i> (Ehrenberg)				+					
<i>L. rhenana</i> Hauer				+					
* <i>L. rhytida</i> Harring & Myers	+								
<i>L. signifera</i> (Sennings)	+	+	+	+			+	+	+
** <i>L. sympoda</i> Hauer		+						+	
<i>L. tenuiseta</i> Harring	+		+	+				+	+
<i>L. undulata</i> Hauer	+	+		+	+			+	+
<i>L. unguitata</i> (Fadeev)	+				+		+		
<i>L. ungulata</i> (Gosse)	+		+				+		
*** <i>L. new species</i>	+								
<i>Lepadella apsicora</i> (Myers)		+		+					
<i>L. apsida</i> Harring		+			+				
<i>L. biloba</i> (Hauer)		+	+						
<i>L. dactyliseta</i> Stenroos	+								
* <i>L. heterostyla</i> Murray	+								
<i>L. latusinus</i> (Hilgendorf)		+							

Species	Stations								
	1	2	3	4	5	6	7	8	9
* <i>Lepadella linduai</i> Koste					+				
** <i>L. minoruoides</i> Koste & Robertson	+								
<i>L. ovalis</i> (O.F. Müller)					+				
<i>L. patella</i> (O.F. Müller)								+	
<i>L. quadricarinata</i> (Stenrous)	+			+	+				
<i>L. rhomboides</i> (Gosse)	+		+				+		
<i>L. vandenbrandei</i> Gillard	+								
<i>L. triba</i> Myers		+					+	+	
<i>Macrochaetus sericus</i> (Thorpe)		+		+					
* <i>Monommata actices</i> Myers	+			+				+	
<i>Mytilina compressa</i> (Gosse)							+		
<i>Notommata copeus</i> Ehrenberg	+								
* <i>N. pseudocerberus</i> De Beauchamp		+							
<i>Platonus patulus</i> (O.F. Müller)	+		+	+					
<i>Platylas quadricornis</i> (Ehrenberg)	+								
<i>Polyarthra minor</i> Voigt								+	
* <i>P. remata</i> (Skorikov)	+	+							
<i>P. vulgaris</i> Carlin	+	+		+				+	
<i>Scaridium bostjani</i> Daems & Dumont	+		+						
<i>S. longicaudum</i> (O.F. Müller)		+							
<i>Squatina lamellaris</i> (O.F. Müller)				+				+	
<i>Testudinella brevicaudata</i> Yamamoto			+						
<i>T. patina</i> (Hermann)					+		+		
* <i>T. walkeri</i> Koste & Shiel					+				
<i>Trichocerca cylindrica</i> (Imhof)					+				
<i>T. flagellata</i> Hauer		+			+				
<i>T. hollaerti</i> De Smet		+							
<i>T. insignis</i> (Herrick)	+		+		+		+		
<i>T. relicta</i> Doner		+							
<i>T. ruttneri</i> Doner	+				+	+			
<i>T. similis</i> (Wierzejski)	+							+	
<i>T. tropis</i> Hauer									+
*** <i>T. new species</i>	+								+
<i>Trichotria tetractis</i> (Ehrenberg)	+							+	

## CLADOCERA

Family Bosminidae

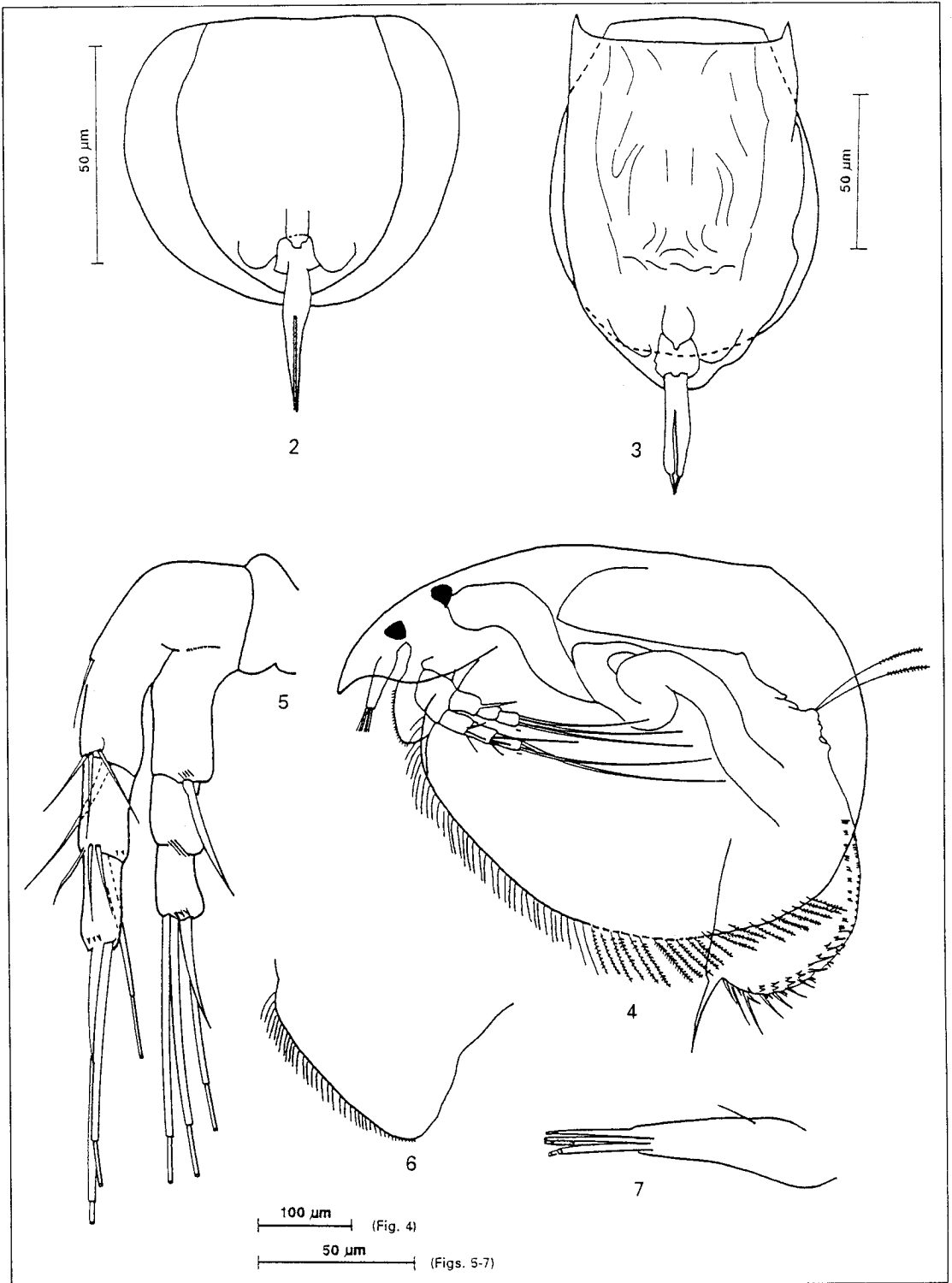
*Bosminopsis deitersi* Richard

+

+

+

Species	Stations								
	1	2	3	4	5	6	7	8	9
Family Chydoridae									
* <i>Alona archeri</i> Sars				+					
<i>A. davidi</i> Richard			+						
<i>A. karua</i> King		+						+	
* <i>A. rectangula</i> Sars			+						
* <i>Alonella excisa</i> (Fischer)		+							
* <i>Camptocercus uncinatus</i> Smirnov		+							
<i>Chydorus eurynotus</i> Sars						+		+	
* <i>C. eurynotus reticulatus</i> Daday		+							
<i>Dunhevedia crassa</i> King						+			
<i>Ephemeroporus barroisi</i> group		+	+			+			
* <i>Euryalona orientalis</i> (Deday)		+							
* <i>Leydigia ciliata</i> Gauthier			+						
Family Macrotrichidae									
<i>Macrotrix flabelligera</i> Smirnov		+							
<i>M. spinosa</i> King								+	
<i>M. triserialis</i> Brady		+	+	+					
Family Sididae									
<i>Diaphanosoma excisum</i> Sars		+	+						
<b>COPEPODA</b>									
CYCLOPOIDA									
Family Cyclopidae									
Subfamily Cyclopinae									
<i>Mesocyclops thermocyclopoides</i> Harada						+			
CALANOIDA									
Family Pseudodiaptomus									
* <i>Schmackeria</i> species									+
Family Acartiidae									
* <i>Acartiella sinensis</i> Shen & Lee							+	+	

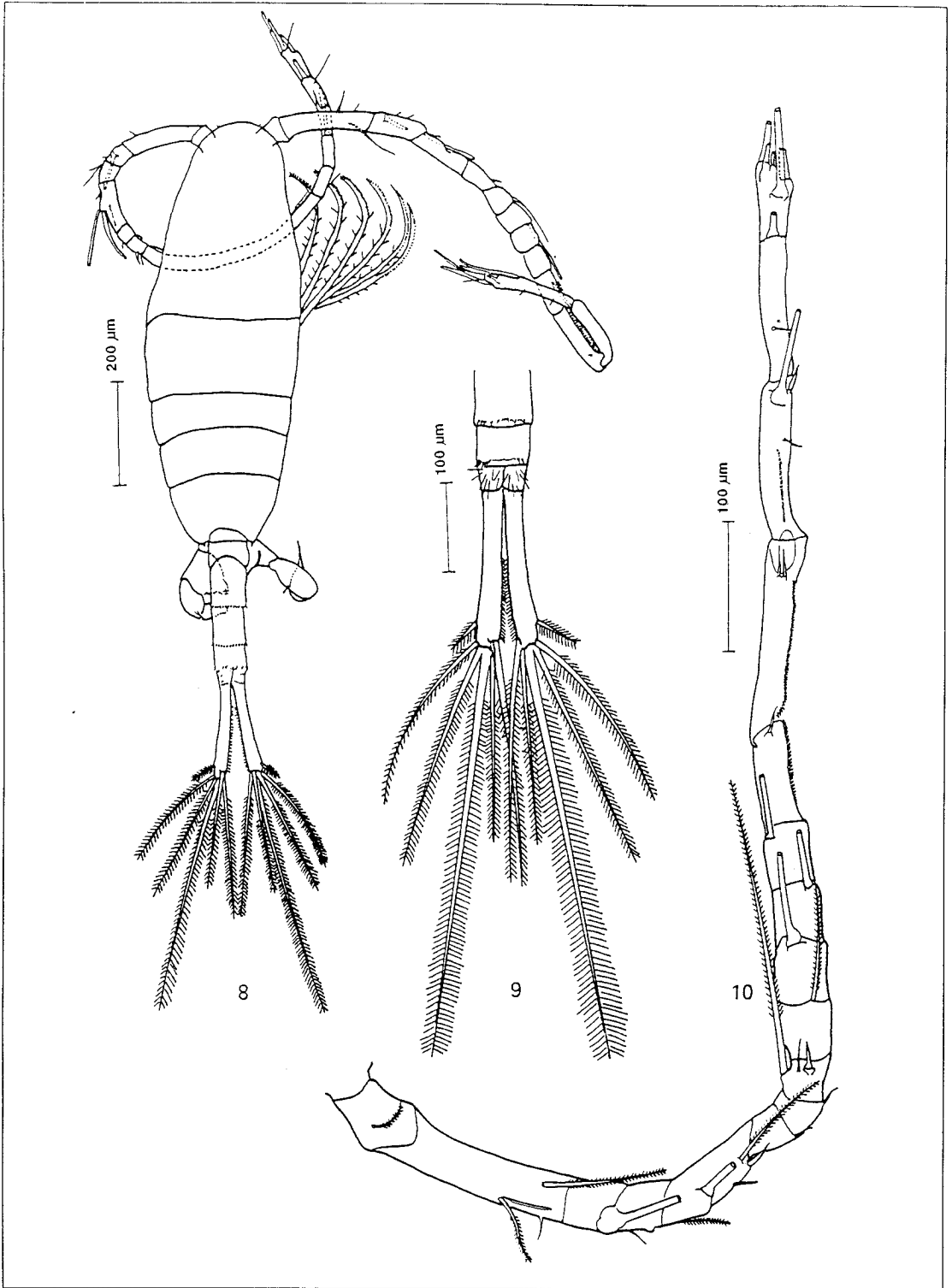


**Fig. 2.** *Lecane minuta*, ventral view.

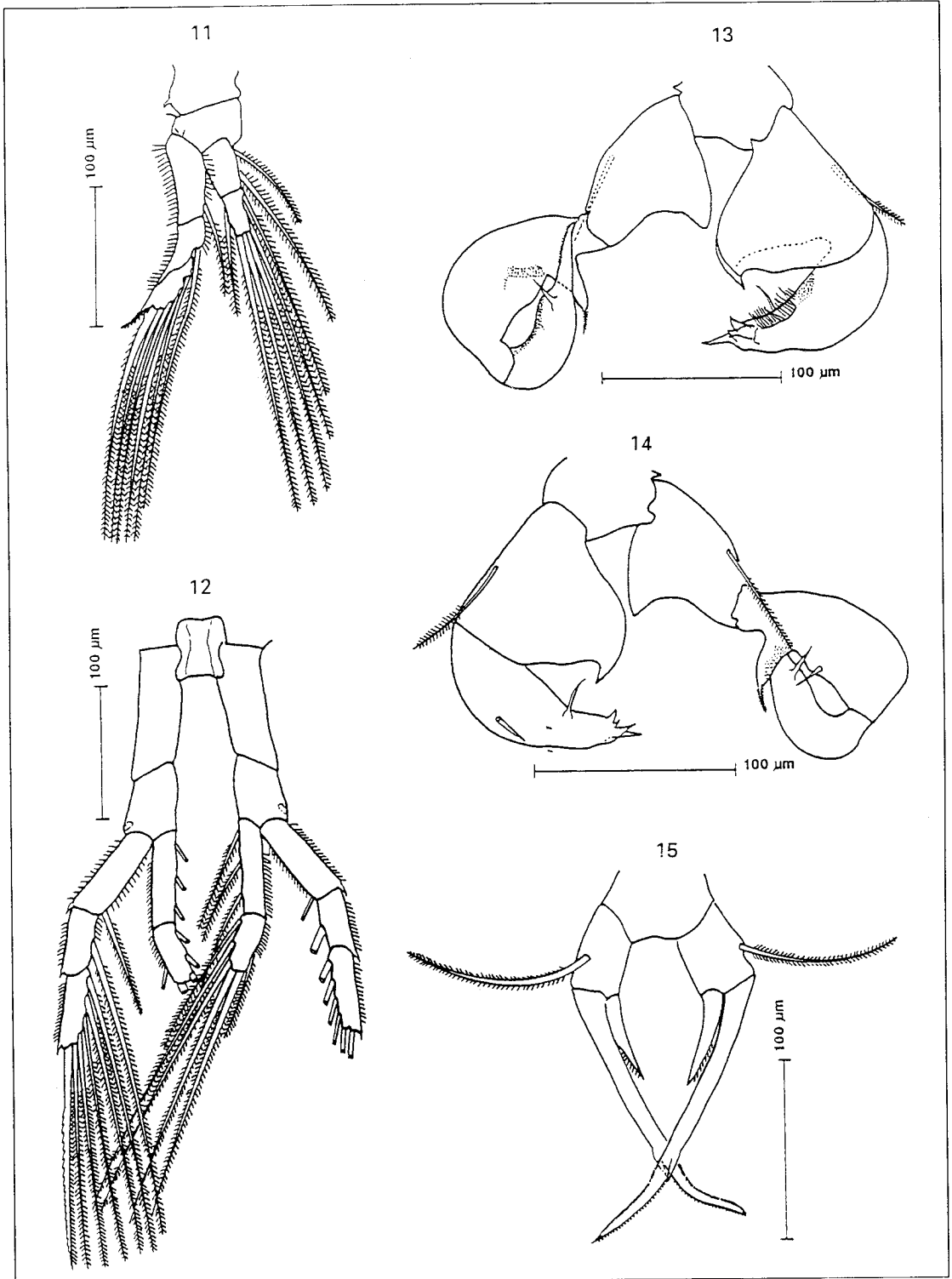
**Fig. 3.** *Lecane symпода*, ventral view.

**Fig. 4-7** *Leydigia ciliata*. 4: female in lateral view, 5: antenna, 6: labrum, 7: antennule.





**Fig. 8-10** *Acartiella sinensis*. 8: male habitus in dorsal view, 9: abdominal segments and furca in dorsal view, 10: male right antennule.



**Fig. 11-15** *Acartiella sinensis*. 11: first leg, 12: fourth leg, 13: male fifth leg in frontal view, 14: male fifth leg in caudal view, 15: female fifth leg.

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